UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C., 20460

ENVIRONMENTAL FATE AND EFFECTS DIVISION OFFICE OF PESTICIDE PROGRAMS

MEMORANDUM

Subject: EFED's Photoxicity Data Requirement for Sodium Acifluorfen RED
Chemical: 114402
DP Barcode: D280712

To: Christina L. Scheltema, Chemical Review Manager
Special Review & Reregistration Division 7508W

From: James J. Goodyear, Ph.D., Biologist

Thru: Kevin Costello, Acting Chief
Environmental Risk Branch 3
Environmental Fate & Effects Division 7507C

Acifluorfen is a member of aclass of herbicides that act by inhibiting the enzymes in biosynthetic pathways when exposed to light. In the presence of light these chemicals are powerful generators of singlet oxygen that causes lipid membrane peroxidation leading to a rapid loss of turgidity and foliar burns in plants. Photosensitivity is not a commonly reported symptom of LDPH exposure in animals. It cannot be determined if acifluorfen shows this characteristic unless a study is conducted.

EFED's Aquatic Biology Tech Team recommends that phototoxicity studies be conducted on herbicides with this mode of action to determine if animals exposed to them and sunlight show increased toxicity relative to controls exposed to them and low intensity light. The results of these studies will help to determine if animals exposed to sunlight in use areas are at higher risk than guideline toxicity studies suggest.

EFED will require that an aquatic phototoxicity study be conducted. A fish early life stage study or an amphibian study using tadpoles are possibilities. Anuran amphibian species have been the focus of many phototoxicity studies (Zage *et al*, 1998; Hatch and Burton, 1998; Walker *et al*., 1998) and protocols for standard toxicity tests have also been published (ASTM, 1994). In nature, amphibians may be exposed to acifluorfen and its degradation products through run-off and spray drift or through seepage discharge of contaminated groundwater. They are also known to inhabit shallow water bodies that would be exposed to high levels of solar radiation. Therefore, amphibians may exhibit light-induced toxic effects. **The choice of an experimental subject and the protocol should be submitted for review**

and agreement by both parties prior to study initiation.

The following are some of the areas to be addressed:

Endpoints- Behavioral observations should be made in addition to measurements of mortality, growth, weight, morphology, and appearance. Ideally, measurements of protoporphyrin and heme concentrations in the blood and protox activity in the liver of each test organisms should be made.

Light sources- Artificial light may be preferred to natural light that will vary in different regions and seasons and with weather. If artificial light is used, the light should resemble full, natural sunlight as closely as possible. No matter what the light source, the duration and intensity of UV and visible light should be reported at all wavelengths (200-800 nanometers).

Dark, light, and positive controls- As this study is intended to identify potential effects of light on LDPH toxicity, an appropriate study protocol should include a dark, or a low light, control group. Another group that is not exposed to chemicals but is exposed to full light should be included (a full light control). In addition to the dark and light controls, a positive control group using protoporphyrin IX would be useful.

Dosing- A range finding study should be conducted under defined low light conditions to identify an LC50 value and lower dose levels expected to be similar to controls. Doses used in the phototoxicity study should not be expected to result in significant mortality in low light controls. Dissolved concentrations of the test chemical should be confirmed by an appropriate analytical method.

Exposure chambers and light filters- Chambers should allow UV and visible light to penetrate. To ensure consistent transmittance of the light, the filters should be cured under the study light for 72-hours before the start of the study

REFERENCES

American Society for Testing and Materials. 1994. Standard guide for conducting the frog embryo teratogenesis assay-*Xenopus*. E 1439-91. In *Annual Book of ASTM Standards*, Vol 11.5, pp. 825-835. Philadelphia, PA.

Hatch, A.C. and G.A. Burton, Jr., 1998. Effects of photoinduced toxicity of fluoranthene on amphibian embryos and larvae. Environmental Toxicology and Chemistry **17**: 1777-1785.

Walker, S.E., D.H. Taylor, and J.T. Oris. 1998. Behavioral and histopathological effects of fluoranthene on bullfrog larvae (*Rana catesbeiana*). . **17**: 734-739.

Zaga, A., E.E. Little, C.F. Rabeni, and M.R. Ellersieck. 1998. Photoenhanced toxicity of a carbamate insecticide to early life stage anuran amphibians. Environmental Toxicology and Chemistry **17**: 2543 - 2553.